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Rockhounds' NATIONAL Magazine

San Luis Valley, Land of Contrasts (See page 9)

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EDITOR'S MEMO PAD

As recently as twenty-five years ago there were many of the natural elements which were listed in the literature as having few if any practical uses to man; in other words most of them were just plain museum or chemical curiosities.

Since the start of World War II, however, this picture has been entirely changed, and several elements formerly considered of little or no value are now prominently in the news, of great importance, not only to industry but to our own national defense as well.

Some are now even referred to as "Magic Metals." Minerals which have been part of the Earth's crust for millions of years but practically unheard of by the man on the street, are at present being named frequently in brokers' circulars and financial periodicals; not because they are new discoveries but because new uses are being discovered for them by scientists working on atomic fission or fusion.

Uranium has held the spotlight as the primary fuel for atomic power, with more energy obtainable from a single pound than from 2½ million pounds of coal, but thorium can be converted into fissionable materials in the form of a uranium isotope.

Still other metals not in general use are finding new employment in the field of nuclear science for control of the atomic fission process and for shielding against the deadly radiations from nuclear reactors.

Lithium, lightest of the metals, is believed to have important uses in both uranium (fission) bombs and hydrogen (fusion) bombs. Zirconium, rarely mentioned before the present atomic research era, is used in construction of nuclear reactor power plants, because of its low absorption of neutrons, the minute missiles used to split atoms.

Beryllium is another of the wonder metals. Like zirconium, it does not absorb the slower neutrons, thus conserving them for the function of keeping the chain reaction going.

Less is heard now about the highly speculative "penny" stock uranium promotions than two or three years ago, and the production of that metal is largely in the hands of older companies with the necessary capital to develop ore bodies.

A leading producer of thorium (from purchased monazite) is Lindsay Chemical Company, whose stock has had a phenomenal rise since the first chain reactions. In 1953 Crane Company organized Heavy Minerals Company, which is operated in association with Vitro Corporation of America, a leader in uranium mining and refining. Heavy Minerals is reported to own large deposits of source materials for thorium, titanium, zirconium, and rare earth ores near Aiken, S. C., and Panama City, Fla. A processing plant under construction at Chattanooga, Tenn., will produce those metals.

Among other companies active in minerals, other than uranium and thorium, used in the atomic program are Lithium Corporation of America, Foote Mineral Company, American Potash and Chemical Corporation, and Beryllium Corporation. Sources of zirconium include National Distillers Products Corporation, National Research Corporation and Carborundum Company, which also processes hafnium for the atomic energy commission.

There are various producers of titanium. E. I. du Pont de Nemours & Company produces sodium, which is used in liquid form as coolant for nuclear reactors.

Earth Science is not getting anything out of this "plug," but we thought it might be worthwhile for our "lone-wolf" prospectors and readers to know whom they might contact if you know of an undeveloped mineral source of any of these metals, many of which are not uncommon, that would be sufficient size to work on.

* * *

PERSONS AND EVENTS

Scouts love rocks! Alan Kempske, age 9, who lives at Cockeyville, Md., proudly exhibits his collection of minerals.

From Washington, D.C., comes the announcement that more than four million men and boys will have an opportunity to get acquainted with geology next Fall because October, 1957 has been designated "Geology Month" by the Boy Scouts of America. A program of activity that is being prepared by the American Geological Institute and Boy Scout committees, will be outlined in the official Program Quarterly of the Boy Scouts of America that will be distributed late next Summer. The outline is to be supplemented by a kit that will describe various activities for Scout troops and Explorer units to use as a guide for the month's activity. This kit will be produced and distributed to the 68,000 Scout and Explorer units throughout the country by the American Petroleum Institute. When available, copies of the kit may be obtained by geologists at local council offices.

It is planned to emphasize both indoor and outdoor activities. Field trips are to be organized on a troop or council basis, depending upon local conditions or upon the availability of a geologist to lead these groups. Directions are included for collecting, labeling, and displaying various kinds of geological materials. Ways will be suggested for constructing many kinds of models and displays, and for conducting games and contests.

A "Tradin' Post" will be set-up through which troops favorably situated for collecting can trade their unusual specimens with other troops over the country. Those having tradin' material will send a card and a stamped envelope to BSA headquarters and will receive in return a list of all troops in the country with things to trade. The cards will be found in the kit. It is possible that this activity will continue long after the end of October, 1957. Competition can be injected in this part of the program by offering prizes for the best collections and models built in the council.

The climax of the program is found in the good turn for the month. The prize-winning displays will be presented to the science department of the high schools and junior high schools in the council area. In many places these schools now have no geological materials available for the use of their science classes.

Actual copy preparation is now underway. However, the committees urge that geologists who know about craft projects, games, geological activities, etc., send them to Chalmer L. Cooper, U.S. Geological Survey, Washington 25, D. C. as soon as possible. In addition *Boys' Life* and *Scouting* want interesting geological stories for the October, 1957, issues. Copy should be received by February, 1957.

We are urging all of our readers who are qualified to help on this very worthy program to volunteer their services to Scout Masters in their community. We can think of no better activity for our Local and Federated Societies to join in and put their shoulders to. It will pay big dividends in many ways. Come On Folks, let's get aboard the band wagon!

*

From MRS. G. HAYS of Des Moines, Ia., comes word that the splendid collection of minerals, fossil woods, Indian artifacts, and many fine works of art in the form of ivory and jade carvings, belonging to the late H. R. STRAIGHT of Adel, Ia., is to be placed in custody of the CENTRAL IOWA MINERAL SOCIETY, of Des Moines, with the agreement that the collection is to remain intact, and in due time to be housed in adequate quarters where it may be admired and studied by all who may so desire.

It had been the ambition of "Hal" for many years to build a museum room in connection with the Adel Public Library, where his collection and that of a friend who also had a splendid collection of archeological material, might be displayed locally. His sudden death cut short their plans, which did not materialize, and so the responsibility of caring for it now rests with the Central Iowa Society, of which he was a member, sponsor, and past president.

Mrs. Hays reports that their group has assumed this responsibility seriously, due to their deep respect for Mr. Straight and the great value of his collection, and that they are formulating long range plans to care for it in the manner which it deserves. They will welcome any help or suggestions which anyone can offer in solving their problem. They do not propose to turn the collection over to any Public institution such as a school or library, where it might eventually be neglected or even junked, as so often happens through changing or irresponsible management in such cases.

HALVER R. STRAIGHT, industrialist, who died on September 28, 1956, was a past president of the Midwest Federation, and a loyal friend of EARTH SCIENCE, of which he was a Charter Life Subscriber.

*

EARTH SCIENCE magazine has found a friend in the person of GUS BROWN, of the Des Moines Lapidary Society, who is acting as general liaison officer between the Midwest Federation Societies, and EARTH SCIENCE, the Federation's official organ, having sent in more than twenty-five new subscriptions since the convention in July. He is encouraging some friend of the magazine in every club to do as well, and if he succeeds we will soon be "out of the woods," so to speak, and on the high-road toward complete success. His efforts are greatly appreciated.

"Gus" is the author of that splendid article in our September-October issue which was so well received by our readers, entitled "Rockhounding with the V-Lock," in which he comes up with an entirely new method of mounting gem stones for the amateur lapidary. Mr. Brown has promised to write other articles for us in future issues. Be watching for them.

Last year we had the pleasure of announcing the XXth INTERNATIONAL GEOLOGICAL CONGRESS which was held in Mexico in September (see article by H. P. Zuidema in our July-August, 1956, issue), and now we are happy to announce that this year's congress will convene in Madrid, Spain, on September 20 and will close on October 3, in Barcelona, "dedicating eight days between both cities to sessions of work and short excursions to the environs."

"A collective trip of six days will start from Madrid, ending in Barcelona, passing through Valencia, Alicante and Mallorca, with the object of studying the Mediterranean Queaternary formations and the Paleolitic beds of the Spanish Levante." We are publishing this information for the benefit of our many subscribers across the seas who may wish to take advantage of this meeting of kindred minds.

* * *

Following the annual pilgrimage to the Wilmington, Ill., strip-mines for fern fossils, SELMA JENNER was prompted to contribute this verse by Louise Darcey to the official bulletin of the CHICAGO ROCKS AND MINERALS CLUB, *Pick and Dop Stick,* from which it is here reprinted:

In Botany Class

This fern embedded in a rock,
Outlined of perfect frond and stalk,
Was green in some far-distant year,
When living beauty did appear.
I hold the rock within my hand,
And as I look I understand
How wondrous is this hardened lace,
Preserved through eons, a thing of grace
And loveliness, a rare design
Devoid of color, but in line
So delicate with tracery,
I gaze at it and seem to see
Luxuriance of sunlit jade:
Ferns growing in a hidden glade.

* * *

PHOENIX GEM AND MINERAL SHOW, scheduled for March 1, 2, 3, 1957, will again be sponsored by AiResearch Lapidary Society, Maricopa Lapidary Society and Mineralogical Society of Arizona, and will feature completely new and outstanding displays.

One exhibit will feature GOLD NUGGETS. The dramatic history of Arizona is written in GOLD NUGGETS. Many of these spectacular nuggets have never been processed and are in prized collections today. Several of these collections will be displayed, together with names of localities where they were found. Some will also be from other states.

IN MEMORIAM

We are sorry to make this belated announcement of the death of Mr. Norman Poole, on June 4, 1956, in Chicago, Ill., at the age of 73 years. Mr. Poole was widely known among both amateur and professional geologists as mining engineer and mineral collector. He was born and educated in England, came to Nova Scotia as a young man and engaged in railroad work.

Later he took up ranching in Montana and finally went into mining as a promoter and developer of copper and vermiculite mines. He was the organizer of the Southern Vermiculite Company, with headquarters at Frankin, N. C. In recent years he made his home in Chicago and was an active member of the Marquette Geologists Association.

* * *

AUTHORS

RICHARD M. PEARL is professor of geology in Colorado College, Colorado Springs, Colo. JUNE CULP ZEITNER, of South Dakota, is familiar to our readers for delightful accounts of the field trips of her husband and herself. RICHARD D. OSTERHOLM is editor of the *Opinion-Tribune* of Glenwood, Ia. C. W. WOLFE, of the faculty of Boston University, is both a scientist of distinction and a down-to-earth rockhound (see his story of a trip to "A Mineral Collector's Paradise," in our May-June, 1955, issue). BERNICE WIENRANK is an able and devoted worker for the Midwest Federation and its magazine, who needs no introduction. Nor, ditto, WILLIAM H. ALLAWAY! E. D. CORNWELL, chemist, is an associate with Mr. Allaway on the staff of Western Electric, Chicago.

—BEN HUR WILSON, *Editor*

INDEX TO ADVERTISERS

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Earth Science

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San Luis Valley, Land of Contrasts

by Richard M. Pearl

If you could look down upon the south-central part of Colorado from a sufficiently high balloon, you might believe that a giant left hand wearing a mitten had been pressed down here against a mass of modeling clay. Beneath the hand the clay has been squeezed flat, while the excess has been forced outward, forming a high rim around the mitten. This mitten is almost the size of Connecticut.

The section of the state just described is the San Luis Valley, largest of the huge flat areas or parks enclosed within the Colorado Rockies. This is a land of contradictions, a land of romantic history, and a land that has calmly ignored the rest of Colorado as much as it possibly could for nearly two centuries.

For the contradictions, picture the same place as being the driest part of Colorado and the wettest — both at the same time. Imagine arid-region shrubs and alkali flats immediately next to water-soaked ground. Think, too, of lakes and sand dunes and disappearing streams.

For the romantic history, recall the million-acre Sangre de Cristo Grant given by the Mexican government in 1843 to a man and a thirteen-year-old boy. The Trinchera Ranch, the largest private estate in Colorado, is only a quarter fragment of that vast grant. Fort Garland stands as evidence of Ute Indian raids of pioneer times. The strange Society of the Penitentes, still practicing the ancient ceremonies of blood-letting and flagellation, is represented in the Valley by some of its members.

For the isolation of the San Luis Valley, regard it as almost an independent kingdom, belonging loosely to Colorado politically and in its economy, but maintaining cultural ties of language and religion with the Spanish-speaking folk of New Mexico. The mountains that seem to have been pressed out from beneath the mitten are an effective barrier, preserving in the San Luis Valley an individuality unlike any other part of the state.

Going southward over Poncha Pass from Salida the tourist descends onto an amazingly level terrain having an average altitude of about 7,500 feet. In its flatness it reminds him of the dried bed of a prehistoric lake — for that is what the northern part of the San Luis Valley is. It is framed on the east by the majestic Sangre de Cristo Range, a narrow arch, in few places more than five miles wide, rising to dizzy heights marked by a succession of sharp sky-piercing peaks which culminate in Sierra Blanca (14,363 feet), one of the most spectacular masses in the Rockies. Here at La Veta Pass the range swings to the east in a huge loop, and then proceeds as the Culbear Range straight to New Mexico, where its sudden ending marks the southern extremity of the true Rocky Mountains.

The western limits of the Valley are not so sharply defined, but low foothills mark the beginning of the San Juan Mountains. The San Luis Hills, a group of volcanic mesas, cut across part of the Valley near the state border.

Of course, the San Luis Valley isn't a valley at all! That would be too much consistency to expect of this land of contradictions. Instead it is actually a park, as this term is used in the West. A simplified view of its origin begins with a rising Sangre de Cristos and a correspondingly lowered San Luis Valley. The floor of the Valley was being covered by sediments (the Santa Fe formation) eroded from the mountains, as well as by sheets of dark lava which flowed from openings in the earth.

Then the center of the Valley was warped downward more than a thousand feet, and the southern end was blocked by a natural dam of lava, which now is seen as the table-top mountains known as the San Luis Hills. This lava prevented the drainage of the Valley, and thus a fresh-water lake was created. Sometimes the lake shrank so that moss and other plants grew in its alkaline waters. Beds of sand and clay were deposited in this lake until it overflowed across the San Luis Hills and was drained along the course of the present Rio Grande which is the main stream of the Valley and emerges from it through a canyon about one thousand feet deep.

It is these top beds of sediment, changed into rock called the Alamosa formation, which provide the most remarkable feature of this extraordinary area. The center of the San Luis Valley has less rain than any other place in the whole state, yet about 1,500 artesian wells bring forth floods of pure cold water, the best production exceeding 3,000 gallons a minute. This is because the Valley is a splendid example of an artesian basin.

The layers of rock come to the surface at the rim of the basin, where they catch the streams descending from the mountains. The clay is compact, but the sandstone is porous and absorbs the water, which moves into and beneath the Valley, held in by clay above and below. The pressure behind the water is often sufficient to force it to the surface without pumping, wherever there is an outlet. Many wells are obtained merely by sinking a pipe down to the water-bearing layers of rock. In winter the overflow from artesian wells spouts from the earth in frozen fountains.

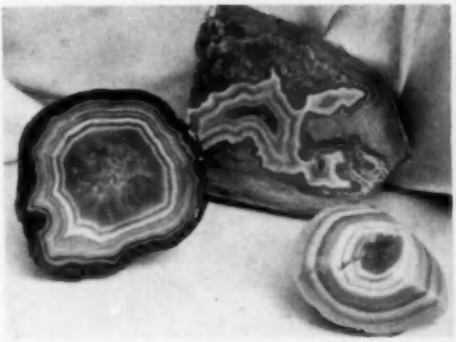
Although the ground is saturated with

Poncha Pass, North Entrance to San Luis Valley water near the wells and springs, and irrigation is widely practiced, greasewood and similar dryland shrubs abound. The method of "subirrigation" has the effect of concentrating sodium salts on the surface, making white alkali ponds and flats. The shifting hills of sand in Great Sand Dunes National Monument add still another touch of anomaly to this water-saturated basin, this strange land of contrasts in southern Colorado.

The Fairburn Agate

by JUNE CULP ZEITNER

ABOUT 50 YEARS ago it was an easy matter to take a stroll in western South Dakota and return with a pail full of the brightest agates in the world. Just last week four of us spent three days combing the old productive beds and were not surprised to end the search empty handed.



"The Fairburn is the stone at the left. Often mistaken for it is the Tepee Agate (center), also from South Dakota. Nearest rival to Fairburn for color is Mexican Fortification Agate (right.)"

The beautiful fairburns were first discovered in the Kern "beds," 14 miles east of the village of Fairburn. The agates weather out of the sedimentary deposits of the rough eroded badlands. The rock deposits are vast. Although every rock bed shows evidence of concentrated hunting, there never seems to be a dent in the supply. Most of the rocks are of the quartz family. They include jasper, agatized wood, chalcedony, rose quartz, conglomerate, agatized coral, and geodes.

When the agates were first found, "Grandma" Kern fell in love with the fine specimens so abundant on her own land. Every spare moment would find her seeking bigger and better specimens. She turned down fabulous offers for her collection. In later years "Grandma" became almost blind, and couldn't tell a fairburn from a hunk of quartz. She had previously been known to take a shot or two at intruding rockhounds. Now however she changed her tactics. She welcomed rock hunters. She would follow them around endlessly offering them cold cash for each rock they picked up. She wore a nail apron full of cash for the purpose.

When visitors would call on "Grandma" to view her collection, many of them would depart with a choice souvenir or two. Their logic was simple. The old lady couldn't see anyway and someone was bound to take the agates, so why wait for the other fellow. At about this stage the Kellogs, of cereal fame, of Battle Creek, Mich., began making generous offers for the Kern collection. Finally when many of the best agates were gone and Grandma was destitute and stone blind she sold out to Kellog.

At the present time it is still possible for a patient collector to find good agates in the Kern beds. We know now, however, that the home of the fairburn stretches from northeast to southwest diagonally for 200 miles or more. Fairburns have been picked up at Wasta, S. D., Orella, Neb., Lusk, Wyo., and many points in between. Gus Aldinger of Custer gave us a fairburn type agate which he picked up in Montana. Charles Bass gave us a Fairburn type agate from Wyoming, and we have found many in the noted South Dakota and Nebraska localities.

As in other well known areas legends and lore have grown to a point where it is hard to tell fact from fiction. There are rumors that in hidden badlands spots it is possible to scoop up the fairburns; that we Dakotans keep our good locations to ourselves; that a man near Custer has a fairburn mine. Discount those stories 100%. But on the other hand here are some "tales" that are facts. A good fist-sized fairburn will bring $200.00; an ex-

"Quartz family minerals from the Fairburn beds: Jasper, Black Agate, Jasper Conglomerate."

pert can usually tell the origin of a given fairburn at a glance; the pattern always shows on the outside.

What makes the elusive fairburn different than other agates? First the bold fortification patterns are the brightest that nature has seen fit to bestow on agates. Even dyed agate cannot equal the fairburn for color, for it is possible to find red, brown, black, white, yellow, and lavender all in one agate. A stone with 50 to 100 sharply designed bands each in a different shade or tint is not uncommon in fairburns. Often fanciful eyes, quartz crystals and even amethyst fill out the pattern. Many fairburns have a tiny cavity inside but they can seldom be classed as geodes, such as their nearest competitor, the Mexican agates.

Agates similar to the fairburn are also found in South Dakota. One of these is the limestone agate, a gay fortified agate in matrix found near Custer. Variously called "Hell's Canyon" or "Teepee Canyon" agate, this agate is found in a number of mining claims near the Jewel Cave National Monument. It often has amethyst

"Two Quartz family minerals of ten mistaken for Fairburns by novices are (left) Banded Jasper, (right) Agatized Sweet-Water Coral."

crystals in, while the agate itself boasts gypsy tones of reds and yellows with a little purple and orange tossed in for good measure. Another closely associated agate, found in Custer State Park, is known as state park agate. Although the colors are often the same as a fairburn, as a rule they tend more to the pastel, and the agate has a more opalized texture, in contrast to the jasp-agate texture of the fairburn.

All fairburns are not colorful. An expert will identify a black and white fairburn as being from the Oelrichs area, the brown and white could be a Nebraska fairburn, the brightest reds were taken from an area now used as a bombing range, while the "hot pinks" are associated with the original Kern beds. Of course, there are enough exceptions to make "fooling the experts" a good game. We have, for example, a pure white fairburn from the old beds. Albino, no doubt.

The chief fault in these agates is that the Dakota weather is not kind to gemstones. Fractures are common, particularly in those from the Nebraska area which tend to have a softer matrix.

A really good fairburn is all agate, has a complete pattern, no serious fractures, is pleasantly rounded in shape, and brilliant in color.

Although jewelry is sometimes made from fairburns, they are more valuable as specimens. Smoothing the shape down with an emery wheel and polishing the surface pattern is usually all that is needed to make a spectacular cabinet piece. Tin oxide on felt will bring a mirror gleam. The agates which have a quartz center are a little harder to polish, however these quartzy agates take on great beauty when tumbled.

There are many fine collections of fairburns to be viewed in South Dakota. The school of Mines in Rapid City has a typical collection, while almost every rock shop will have at least a few. Many members of the Rapid City and Hot Springs Gem Clubs specialize in fairburns.

One of the finest displays of Fairburns belongs to Tom Fritz, of Crawford, Neb. These specimens came chiefly from the Orella, Neb., beds and were found when collecting brought better results than now. Recently during the new highway construction on U. S. 18 in South Dakota workmen found many good agates in new road cuts. The best chance of finding good agates at the present time is to camp near the old beds in the fall after the grass has has died down. Then concentrate your efforts in the scattered small beds and the adjacent fields. With luck you may still find some real "raving rocks."

Modeling Churches Is His Hobby!

by Richard D. Osterholm

This is a story about the Reverend Laurence E. Murphy, pastor of the Congregational Church of Glenwood, Iowa, who very probably has the distinction of being the only lapidary in the country who specializes in the carving and fashioning of model churches out of alabaster. After all, what could be a more appropriate hobby for a minister of the Gospel, than to make miniature models of churches.

Reverend Murphy is no amateur at this business, on the other hand he is a master craftsman, whose models are not just something thrown together in a bunglesome sort of way, but each in turn might truly be considered a work of art. All accurately made to scale, and the modeling and polishing reflects the same skill and workmanship that one would expect of others who are working with agates and other types of gemstones.

Only recently, he has completed his latest model, to add to his growing and unique collection, which is a replica of a colonial style church, beautifully carved and modeled after one he visited while a guest of a New England congregation two years ago. This particular edifice represents about four hundred hours of painstaking effort distributed over a period of thirteen months.

The alabaster rock used in its construction came from three different states. The walls and part of the porch are made of rock from a quarry in Clarendon, Texas. The columns are of the best type of colored alabaster from Fort Collins, Colo. Portions of the lower part of the bell tower and steeple are also from Colorado and the highest point of the steeple is a very fine quality of alabaster from Texas.

The clock faces, complete with numerals and hands, are made of pure white alabaster from the Black Hills of South Dakota. The doors are made of a very high grade of walnut. The shutters are carved ice cream sticks.

Only on one detail—the church roof—did Rev. Murphy ask for assistance. Painted

THE ARTIST AND HIS MODEL OF THE CONGREGATIONAL CHURCH AT GUILFORD, CONN.

a light green, the roof was made by A. F. Standiford in his hobby wood-working shop.

Small lights which were placed inside the main part of the building and in the steeple add greatly to the beauty of the hand-carved structure.

The actual building of which Rev. Murphy's alabaster model is a reproduction in stone with only minor changes is the present-day Congregational Church located in Guilford, Connecticut.

There is nothing new or novel about building model churches to this minister-lapidarist. As a child he built them of loose bricks he found around his parents' farm near Columbia, Missouri. He's been building them ever since, although, of course, his skill and knowledge of materials have changed considerably.

After entering the ministry, Rev. Murphy felt that he could give illustrated talks to children and an occasional illustrated sermon to his congregation if he had some miniature churches. So, he built some. What's more, he's still building them.

Reverend Murphy says, "Machines can be used in working alabaster but I have used mostly files and course saws. At the quarry in Texas where I get my alabaster now, a cross cut wood saw can be used to cut the very large pieces into cubicular pieces near to the size needed for whatever project I am working on. If I need to cut through a small piece no more than 4 inches thick I use a butcher's saw. A butcher's saw is better than any other kind of a hand saw for light work. A blade will need sharpening after two hours of work. Then you take out the blade and take it to a butcher's supply house and trade it in for a sharp saw the same size. It costs very little.

"Recently I bought a small power sander and before I had the sander I used course sand paper until I got a piece near the size I wanted it. But the power sander with a course belt is faster. To smooth the piece I use wet-dry paper from the "3M Company" beginning with 80D or 280A, then a finer paper, 400A, then a still finer paper 600A. When I have finished with the 600A process the piece is usually as smooth as the ordinary finished marble. All of these different grades of sand paper are used under water. The powder sander of course is used dry.

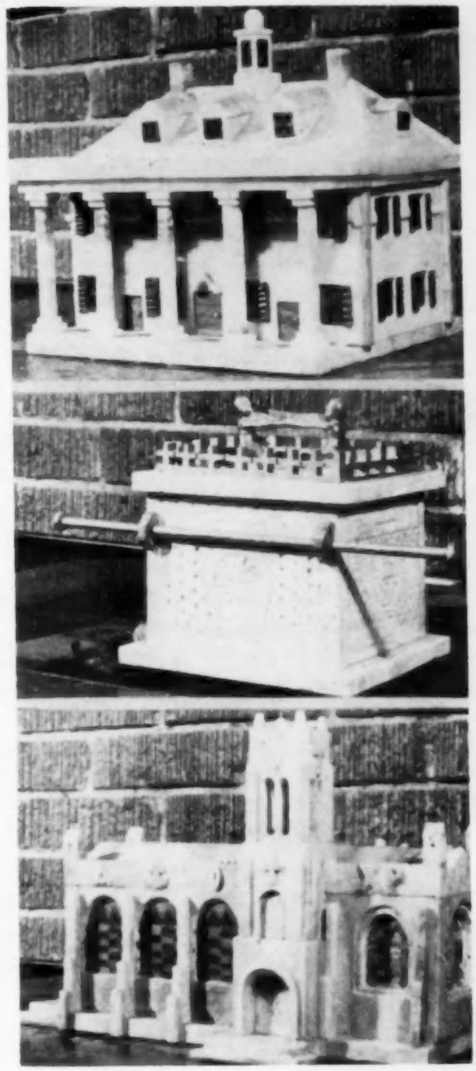
"A jig saw can be used with small pieces of alabaster if you put masking paper on each side of the alabaster piece before you start sawing. But the butcher saw is about as fast in working it. It only takes more muscle. And there is always some danger of breaking the piece with power machinery. Course files—wood files—can be used with alabaster if you use a wire brush to clean them often.

"My churches are not made of solid pieces. The sides or walls are made into slabs first then cemented by Duco Cement. Other kinds can be used but some do not work well with alabaster. Gimlets bits and files are used to make the windows. The windows in the model of the University of Chicago Chapel shown in one of the pictures are made of thin white alabaster—one eighth inch thick—and colored with crayon. No black and white picture can adequately show the beauty of the alabaster and the art windows, which should be taken in color to do them full justice. When I made the chapel there were some materials I did not know about which I could have used. I could have gotten red plastic from a wholesale plastic house and used them for windows. However they would have been all of one color. I used clear plastic for the windows in Mt. Vernon and in the New England Church.

"I have been working on fountain pen desk sets for the past few months. I get the mounts and pens from a friend of mine who runs a quarry in Texas. Then I make the base in the manner described above. The final process is to dip the piece in lacquer. It cannot be put on very well with a brush. Then it is ready to shine either with a soft cloth or a small hand power machine buffer. I get a good shine with a mixture of tallow and whiting. White Jeweler's rouge can be used.

"Almost every person working with alabaster does a little experimenting in the method of polishing. Some use a plastic varnish, some use plain floor varnish of old type. Some soak their pieces 24 hours first in red furniture polish. Some do not use any liquid materials at all but just the shine material. Paraffin, heated can be used. I have found lacquer best as it does not turn yellow with age."

In its June, 1954, issue the *Lapidary Journal* published a feature article containing considerable biographical material concerning Rev. Murphy's earliest efforts and a more detailed description of many of



MT. VERNON, *above;* THE ARK OF THE COVENANT, *center,* AND THE UNIVERSITY OF CHICAGO CHAPEL, *below.*

his finest replicas. It also reveals the fact that he is not only an expert lapidary, but also an historical scholar and author of note as well.

Many of his model churches, including his latest Colonial creation, have been exhibited on numerous occasions, and needless to say they are always the center of attraction. "It is wonderful to have a hobby," says Rev. Murphy, "in which there is so much opportunity for creativeness. It relaxes the mind and is a lot of fun too. There is always a temptation to start making them for sale, but when a hobby is commercialized it ceases to be fun, and takes on the dimension of real work. I have never sold anything that I have made, although I have had many requests."

More Jottings from the Editor's Memo Pad

Robert B. Berry, of Omaha, Neb., founder and first editor of Earth Science, is one of the few experts in the alteration of color in gem stones by the process of gamma irradiation.

On a recent visit to his shop, Frank J. Sadilek, of Des Moines, Ia., and editor of *Trade Wins,* the official trade bulletin of the Midwest Federation, secured two brilliant cut quartz specimens. One is perfectly clear, the other lemon or yellowish color. Here is the story, quoting Sadilek:

"The yellow one was gamma irradiated, with gamma rays for 86 hours at 2x10°—Roetgens or the combined output of a dozen Xray tubes for 5,000 hours. To get this done you have to have a license from the Atomic Energy Commission by complying with U.S. Form 313 certifying that you know what it's all about.

"The cost for the irradiation is about $30.00. Bob is quite a capable scientist, and if you will send him two dollars he will send you two octagon cut stones, one to be clear and the other charged with atomic coloring. To my mind this makes any one stop and think what lies ahead, and he states that this is only scratching the surface. Better get one of these rarities for your specimen collection."

* * *

Iron ore discovery made. Discovery of the largest alluvial deposit of high grade iron ore in the world—one that may well revolutionize the entire steel industry in Western United States and the Orient, was announced last month.

News of the existing deposit, encompassing more than 40,000 acres in the Black Hills, of Arizona, 45 miles northeast of Tucson, was revealed by one of the finders of the mine, 30-year-old Texas engineer-geologist, John Martin.

Of this area, Martin added, a record 200,000,000 tons of iron ore have already been blocked and certified, and blocking operations are being continued at the rate of a million tons per week.

Martin declared that tests of iron ore from the mine made by several of the country's leading laboratories and engineering firms certified the iron content at a phenomenal 60% to 68% FE.

Mining engineers' reports indicated on the basis of present findings that the Black Hills discovery may turn out to be the largest source of high grade iron ore in the world.

* * *

The October issue of *Scientific American* magazine has a very fine article concerning our own Mr. Burnice H. Beane, of LeGrand, Ia., who is without doubt the world's champion crinoid expert, and whose beautiful picture crinoid slabs are to be seen in so many of the great museums of this country and abroad. The Midwest is very proud of Mr. Beane and his work, as perhaps in no other place are there any specimens which can be compared with those superb slabs which are found in the quarry near LeGrand, and so painstakingly etched out into bold relief by this notable and distinguished elderly gentleman.

This work has been a lifetime hobby of Mr. Beane, that has added much pleasure and satisfaction to his many busy years. Most of his etching is done solely with a sharp sewing needle, and some of his slabs have sold for nearly one thousand dollars. Smaller slabs with a few crinoids can be etched in only a few hours, while the larger museum pieces sometimes require as much as three months to complete. Every rockhound should obtain and file a copy of this issue of *Scientific American* for future reference.

The Blister Hypothesis and the Origin of Mineral Deposits

by C. W. Wolfe

The "accident" of geochemical concentration. The late Professor Charles Palache of Harvard University often referred to rare and unique concentrations of unusual minerals as "geologic accidents." Under what circumstances, for example, could strange combinations of minerals such as those at Franklin, N. J., or Langban, or certain sections of the Canadian Shield come into existence? A whole series of factors must have been perfectly coordinated to yield these strange displays of the mineral world.

If treatises on geochemistry are consulted, one feature of the occurrence of elements is outstanding. Aside from ten or twelve elements, no element on earth is known to show concentrations of even one percent of the mass of the earth's crust. Many of the elements which we treasure most and seek so energetically to find occur in percentages which are almost negligible. The entire science of economic geology as related to ore deposits is concerned with the methods whereby elements which occur so sparsely are sufficiently concentrated as to make feasible their extraction. To this problem many answers have been brought a few of which are mentioned below.

Primitive crustal differentiation. If we imagine (although this supposition is not at all necessary to the thesis of this paper) that the primitive earth passed through a liquid stage, there can be no doubt that an early differentiation must have occurred to produce the stratiform earth. To what extent this first differentiation could have resulted in sizable concentrations of the ore elements is, of course, unknown, but it is completely likely that gas fluxing, gravity settling, and other processes produced a crust which has changed but little since that time. Very few geologists believe that magmas arise from great depths in the earth, and it is the thesis of this paper that processes acting near or at the surface of the earth are competent to produce the known mineral deposits from the materials of the primitive crust.

Differentiation of magmas. The concept of hydrothermal solutions which are released by a cooling magma is fundamental to an understanding of many ore deposits. Too often this concept has been linked with a simplified picture of a family tree of differentiates which have been derived from one parent magma, basalt. This approach poses many problems for the economic geologist: why do not all igneous rocks of approximately the same composition spawn hydrothermal solutions and ore deposits of similar character? This is certainly true, although it is not to be expected if there be but one parent type of magma. Many answers have been given, all of which may be valid, in part. There is the suggestion that proper structures and lithologies should exist for impounding solutions. And then, again, there is the easy answer that accidents occur during the course of differentiation, accidents such as crystal settling, filter pressing, and many phase orogenic disturbances which alter the final picture; but none of these suggestions nor any combination of them is completely adequate or satisfactory.

Elemental concentration through weathering. Once igneous rock (either of the original crust or of later emplacements) reaches the surface where there is a different environment of pressure, temperature, and chemistry, weathering immediately ensues. Differentiation by mechanical and chemical weathering, but principally the latter, is certainly as effective, if not more so, for geochemical localization as is magmatic differentiation. Residual soils are commonplace evidence of the change in rock character produced by chemical weathering. The adsorption of potash by clays is well known, and many other comparable or even more marked

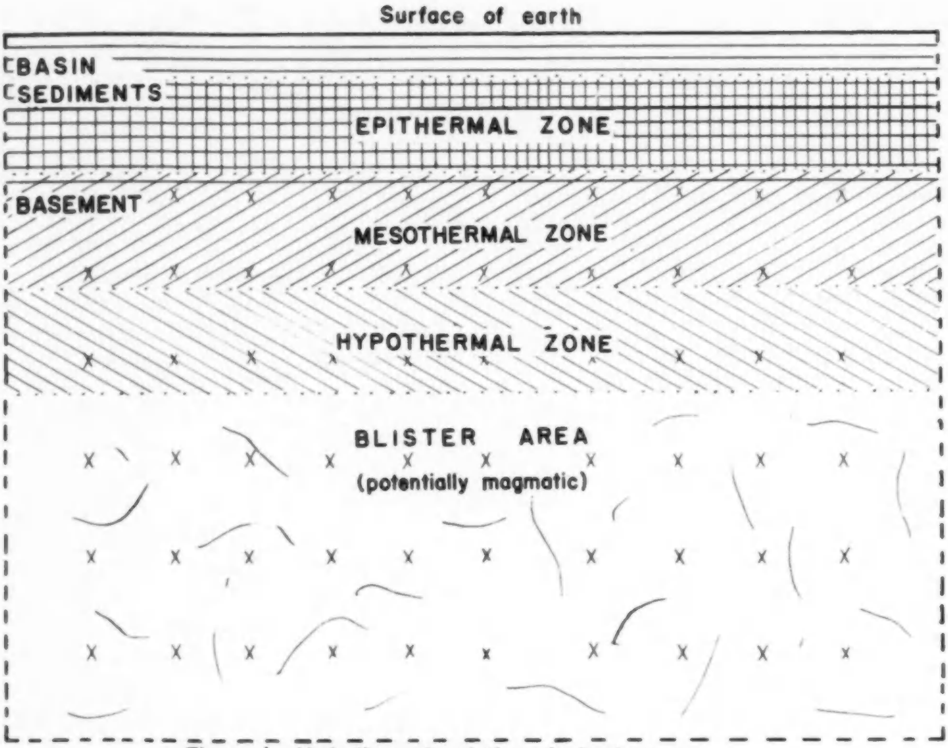


Figure 1. Hydrothermal solutions in basin areas.

Effects of Blister development in a region of basin deposits with thicknesses of a few hundred to a few thousand feet. The boundaries of the hypothermal, mesothermal, and epithermal zones are drawn arbitrarily. They could be shifted vertically in either direction. It is clear that the characteristics of the solutions which develop *in situ* in any section will depend upon the chemical and physical properties of the rocks which are being heated.

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concentrations are well recognized. The dissolved portions of the rock move to various destinations, accentuating the tendency for specialized concentrations.

THROUGH TRANSPORTATION. Add to the effect of weathering the further sorting action which devolves during transportation by streams, winds, or ocean currents. High density minerals are separated from low density minerals, and placer deposits form. Hard, resistant minerals are separated from those which are easily abraded. Minerals with good cleavage are separated from those with poor cleavage. Throughout the entire transportation process geochemical differentiation proceeds.

THROUGH SEDIMENTATION. When the transported materials—either visible or invisible, are fixed as sediments a very profound elemental concentration occurs. Much research is required concerning chemical precipitation in oceanic sediments. It is clear, however, that many substances such as manganese, zinc, lead, uranium, silica, and phosphates have preferential environments for precipitation, and through these preferences new concentrations of elements develop. If the thesis of this paper be correct, economic geologists of the future will be much more concerned with chemical differentiation through sedimentation than they have been in the past.

THROUGH METAMORPHISM. Metamorphism adds its final touch to the process of differentiation, but it is final only in the sense that it ends an orderly sequence whereby unique elemental concentrations may take place. The Blister hypothesis is greatly concerned with this step as will appear below. It is obvious that the process does not end here. More than two billion years of repetitions of parts or all of these sequences of geochemical differentiation have taken place to produce ore concentrations and mineral deposits as we know them today. One of the important theses of this paper holds that unusual deposits are the end result of many repetitions of the various processes of elemental concentration and are rarely formed by one magmatic differentiation. In an earlier paper on the relationship between the Blister hypothesis and petrogenesis I suggested that all post-Lipalian magmas, at least, were originally solid crustal rock which was transformed into magma through

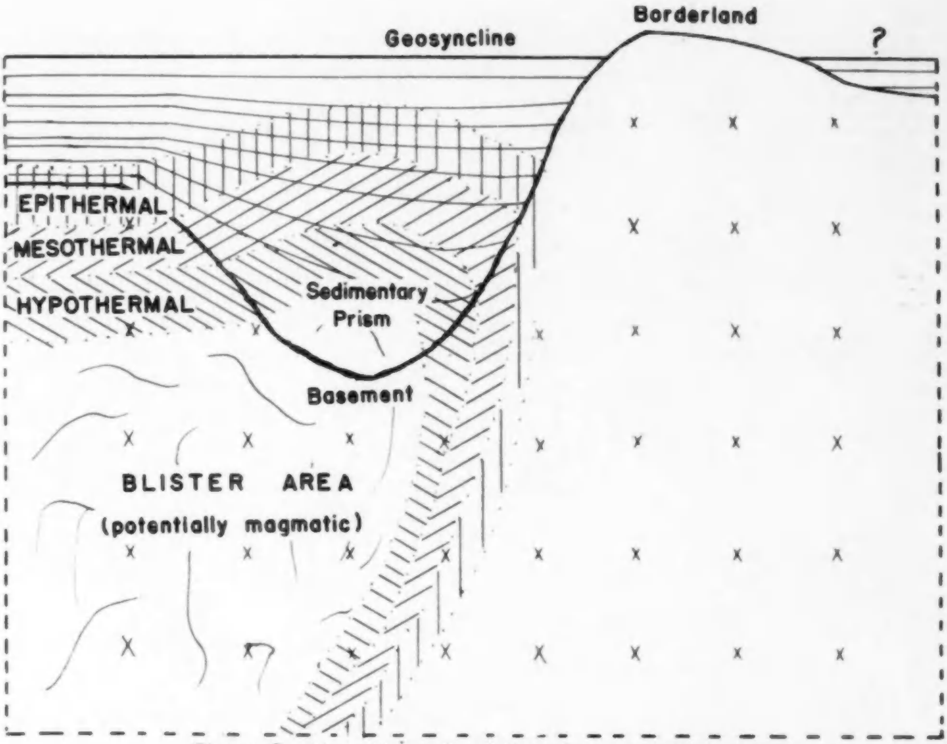

Figure 2. Hydrothermal solutions in geosynclinal areas.

Effects of Blister developments in a geosynclinal region of many thousands of feet of sediments. The blanketing effect of sediment here, as in figure 1, accelerates the accumulation of heat in the Blister region. Metmorphic zones develop with no definite relation to the attitudes or ages of the sedimentary rocks. Ore genesis and pegmatite genesis varies with the composition of the rocks which are heated and with the degree of heating. Magmas may develop at the last stages, deriving from both the basement and from the bottom sediments. The composition of the magmas will represent the bulk composition of the rock prior to heating minus the materials removed by the earlier escape or hydrothermal materials.

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heating in a Blister region. The unique and often strange composition of many igneous rocks is most easily explained if the rocks which were transformed into magma were of unique composition. One parent magmatic source for all magmas is highly discounted in this approach. The obvious tie between magmas and ore solutions is a matter of common knowledge and is treated below. The bearing of the Blister hypothesis on the origins of magmas and hydrothermal solutions is the principal concern here.

THE ROLE OF THE BLISTER HYPOTHESIS IN THE DIFFERENTIATION SEQUENCE. A Blister, as I have defined it in earlier publications (see bibliography) is a warmed and expanded subsurface sector of the outer shell of the earth. In the original paper (1949) I assumed that this expanded section was not less than 15 km. and not more than 600 km. below the surface. At this writing I should be more prone to set the figures at 5 km. and 700-800 km., respectively. The physical state of this expanded sector is visualized as passing from the contracted crystalline to the expanded crystalline to the glassy state. In the final stages magmam would develop at that particular depth where pressure and temperature conditions were favorable. It is not necessary that all parts of a Blister pass through all such phases; and whenever heat escapes from the region, either through the formation and escape of magma or by the formation and escape of hydrothermal solutions, a reversal of Blister development may take place, even to the extent of causing the disappearance of the Blister. Radioactivity is assumed as the source of the heat energy. This heat, from time to time and from place to place, accumulates more rapidly than it is dissipated from the crust, and a Blister is born.

The implications of this hypothesis for economic geology are simple and clear. The heating will be very gentle at first; for the accumulation

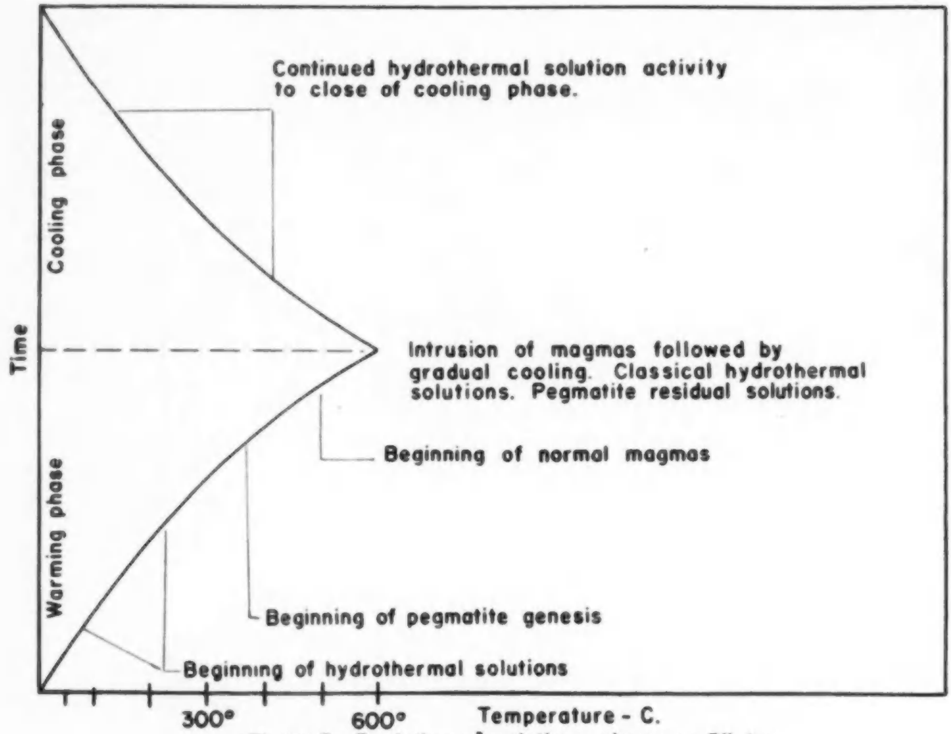

Figure 3. Evolution of solutions above a Blister.

Evolution of solutions above a Blister. As heat is applied in time, the temperature of the rocks increases at accelerated rates because of the decreased conductivity of the rocks at higher temperatures. At low temperatures water, volatiles, and quartz form the first hydrothermal solutions. Other materials, particularly ores, soon follow. If the rocks are of the proper composition, pegmatite fluids move into solution. Normal magmas, with less abundant volatiles, then develop. Ultimately the heating phase must end; and upon cooling, igneous rocks form with hydrothermal solutions and pegmatites as derivatives. If water does not escape from the bulk of the heated rocks, lowering temperatures will be accompanied by retrograde metamorphism and the formation of low temperature pseudomorphs after high temperature crystals. If water does escape, high temperature minerals remain in metastable condition.

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of heat energy is an accelerating process, since the conductivity of rocks for heat decreases with increased temperature. Two geologically different environments are visualized, by way of generalization, in which the heating might proceed. The first (figure 1) is characterized by hundreds or a few thousand feet of relatively horizontal sedimentary rocks, typical of basin sedimentation. The second (figure 2)—the more tectonically active geosynclinal region, that is visualized as forming at the margins of or between Blisters.

The gentle heating of the first phase in either geologic setting is accompanied by a steepening of the thermal gradient. The effects of this increase in temperature would obviously vary in accordance with the bulk composition of the heated rock. Since at least the upper 10 km. of the earth's crust are the result of geochemical differentiation processes mentioned earlier, there would certainly be very little homogeneity vertically or horizontally in the heated rock. In this heterogeneity, the water content would be one of the more important variables.

Water in sedimentary rocks. It is of interest to point out here that many hydrous minerals which are common in sedimentary rocks contain an astonishingly high percentage by volume of water:

		S.G.	% by volume of H_2O
Apatite	$Ca_5(PO_4)_3 \cdot OH$	3.1	5.6
Goethite	$HFeO_2$	4.28	43.8
Gypsum	$CaSO_4 \cdot 2H_2O$	2.3	48.2
Kaolinite	$Al_2Si_2O_5 \cdot (OH)_4$	2.6	12.7
Potash Mica	$H_2KAl_3(SiO_4)_3$	2.8	12.7

If such minerals are heated sufficiently, the sedimentary rocks which contain them would certainly become highly fluid and solution would begin.

Consider, further, the possible existence of connate water in appreciable depth in the crust.

This connate water would be rich in all of the common and also the rare ions of sea water, such as chlorine and gold. A sandstone which is composed of quartz grains has a surprisingly high crushing strength and could readily maintain a notable porosity to depths which would be influenced by Blister heat, particularly if the pores are filled with water which would set up hydrostatic environments. Even weak shales would undoubtedly hold dispersed minute films of water which could only be liberated through heating. Mother liquor trapped in evaporite crystals is still another source of water.

There is, in addition, always the possibility that deep seated artesian flow might bring meteoric water into a Blister area only to leave again with a large thermal increment derived from the Blister's reservoir of thermal energy. The greater the loss of heat by the Blister through the heating of artesian flows or through the conversion of chemically bound water to free water, the less rapidly would the Blister develop. Abnormally steep thermal gradients would develop along the paths of movement of the warmed waters, but in most of the rock cover above the Blister only a minor steepening of the thermal gradient would be found. It is clear that chemically bound water would not be free to act as a solution agent at as low temperatures as would the other two forms, but all of the water which is normally present in sedimentary rocks might readily reach a volumetric percentage of twenty or better. The implications for hydrothermal solutions and metamorphism are clear. Dry metamorphism is practically an impossibility, since the rocks cannot be dry.

Whatever the composition of the heated rock, it is clear that the most soluble portions would move into solution as soon as the temperature rose sufficiently. One of the first solution effects would be the release of chemically bound water and with it other volatile materials such as chlorine, sulfur dioxide, fluorine, and carbon dioxide. In many cases quartz would be dissolved quite early; and if the heating process were to end there, quartz veins and chlorite or epidote (depending on the bulk composition of the altered rock) would be the sole evidence of the early hydrothermal activity. *The early hydrothermal phase, it must be emphasized, precedes and develops independently of the later magnetic phases. It may be the preparatory phase in one region or the terminal phase in another.*

As the temperature continues to rise, further solution would dissolve many of the ore metals; and the average composition of the solutions would gradually change to include more of the less soluble constituents of the rock. The remaining solid material would be the insoluble residue under the existing conditions. During this heating and differential solution phase solutions might or might not be constantly escaping. If the later formed, less soluble constituents do move outward under the driving influence of vapor or orogenic pressures, they would precipitate when they encounter more soluble, earlier deposited materials and replace them. The newly dissolved materials would then move outward to positions farther removed from the heat source. Psuedomorphs and embayments of crystals would be expected under these circumstances. Cavilities in pegmatities are visualized as forming in this manner. There is not need to give an extended description of the behaviour of hydrothermal solutions with which all economic geologists are familiar. It is only their origin which is of importance here.

It is not hard to imagine that under certain circumstances this stage in the solution of the country rock might be the end phase of the thermal activity above a Blister in a particular area, at least for a time. Sufficient outlet for the pent up heat energy by escape of hydrothermal solutions, magmatization, and vulcanism might develop elsewhere, bringing the warming phase to a close. The process might be repeated in the same region several times at widely spaced intervals, or it might be a one phase process.

If sedimentation, both mechanical and chemical, produces an unique geochemical environment, warming of such sediments will release unique hydrothermal solutions. If the warming proceeds far enough, as in the lower sector of a deeply filled geosyncline (figure 2), potash feldspar and muscovite will join the quartz which began to dissolve at lower temperatures. The first sialic magma is born. A vertical section through a warming area would probably show quartz veins surrounding the sialic deposits, a true halo effect. If but little migration of the dissolved potash feldspar, muscovite, and quartz takes place, the sialic magma forms a migmatite with the less soluble ferromagnesian minerals; but if orogenic forces are applied, the newly formed solutions move to positions of least pressure, and pegmatite bodies result with their typical sill, lens, and pod shapes. The residual, undissolved rock would be enriched in ferromagnesian minerals.

According to this view, pegmatities, like most other hydrothermal solutions, are born before the general magmatization takes place; but also, like other hydrothermal solutions, they are released upon the solidification of magmas. If magmas are viewed as hot rock solutions, rather than melts, the foregoing approach to hydrothermal solutions in general is almost mandatory (figure 3). Although the rock modification effects produced by differential solution would vary, depending on many factors, a common sequence of changes would be:

(1) release of water (both connate and chemically bound) and of ultra volatiles.
(2) release of many ore minerals and of silica, forming ore or quartz veins.
(3) release of potash silicate solutions and formation of migmatites or simple pegmatites.
(4) release of sodium silicate, followed by calcium silicate solutions with attack on the pegmatites of stage 3 and the production of replacement pegmatites and pocket deposits.
(5) general magmatization with the incorporation of iron and magnesium silicates.
(6) magmatic emplacement, cooling, differentiation, and further release of pegmatites and other hydrothermal solutions.

The total implications of this approach to metamorphism, to petrogenesis, and to ore genesis cannot be covered here; and it is not at all necessary to do so. If we accept the premise of the Blister hypothesis that varied subcrustal sectors are alternately warming and cooling under the influence of radioactivity and vulcanism, respectively, the foregoing picture of acceleration and diversification of solution lead the economic geologist to a new approach to the distribution of ore minerals in time and space. Instead of looking to magmas as the ultimate source of hydrothermal solutions and ore deposits, he will turn his attention to the probable nature of the rocks out of which the hydrothermal solutions and the magmas were made. He will see in the existence of a Blister, an energy source of sufficient magnitude to supply heat for the production of hydrothermal solutions and magmas, alike.

The vagaries of ore deposition and the uncertainties of magmatic origins will fall into proper perspective, for no longer will ore deposits be visualized as deriving directly from one parent magma, basalt, but from hundreds of millions of years of sorting and resorting by every process of differentiation which currently serves to separate elements in the crust of the earth. Unique metallogenetic provinces are born, accordingly, in regions where the geochemistry was unique at the inception of ore genesis. Thus, the Blister hypothesis in combination with well known geochemical processes gives the *modus operandi* for the translation of disseminated metallic deposits into the multitudinous variety of ore deposits.

Perhaps the dilemma of uranium deposits in the Colorado Plateau—are they sedimentary or igneous in origin—will find its answer in this approach. Did hydrothermal solutions develop *in situ,* dissolve most of the *syngenetic* uranium with its subsequent recrystallization in new positions with hydrothermal characteristics? Does this account for the concordance of paleocene ages derived for so many specimens in the region, since an uranium specimen can only date the last recrystallization in the rock. Could such an explanation be applied to the problem of the Witwatersrand—is the gold there placer or hydrothermal? Could the constant association of large lead zinc deposits with limestone horizons be likewise explained? Perhaps the strange anorthosite and magnetite deposits which are so well known and also so puzzling may result from a differential solution and magmatization of limestone and hematite horizons. Many suggestions of a similar nature might be made, but more work must be done before these suggestions and questions such as those above can be answered. It would seem that enough merit lies within the propositions herein stated to warrant their testing by many petrologists and economic geologists during the next two decades to establish the degree of validity of the approach. Truth is all we seek.

*

*Previous writing by the author on the Blister hypothesis:

1. 1949, The Blister Hypothesis and the Orogenic Cycle. Trans. New York Acad. Sc., vol. 11, April, pp. 188-195.
2. 1949, The Blister Hypothesis. Scientific American, vol. 180, April, pp. 16-21.
3. 1949, The Blister Hypothesis and Geologic Problems, Earth Science, vol. 4, pp. 3-11.
4. 1952, Rock Furnaces. The Explosives Engineer, vol. 30, pp. 7-11.
5. 1952, Outstanding Pegmatites of Maine and New Hampshire. Guidebook of Field Trips in New England; G. S. A. Annual Meeting, Field Trip # 2, pp. 9-93.

*A somewhat different approach to the Blister Hypothesis has been suggested by Professor John L. Rich; 1951, Origin of Compressional Mountains and Associated Phenomena, Bull. Geol. Soc. Amer., vol. 62, pp. 1179-1222.

BOOK REVIEW

"The Earth We Live On," by Ruth Moore. Knopf, 416 pages, $6.

This book will intrigue and fascinate people who are interested in any of the many phases of earth science. It is a truly interesting marshalling of episodes in the lives of great men who had the courage to brave public opinion and if necessary face starvation and ridicule to place before the people the actual facts disclosed by their research regarding the earth's origin. Some of them like T. C. Chamberlin were clever enough to hide their more controversial findings behind a barrage of words and so record their ideas without too much criticism. Who would ever think of mountain forming as "diastrophic embossments"?

The heroes of this book had at least one great common attribute, which was the ability and desire to interpret the phenomena they discovered in a truly scientific manner, even to the extent of contradicting theories and authorities that dominated the thinking of civilization through hundreds of years.

The research involved in Miss Moore's book must have been tremendous and should be highly appreciated by those among us who can now absorb this great story with so little effort.

In simple non-technical language this book tells the story of the great confusion existing in man's mind as he groped for a connecting link between the great historical tradition of the Bible and the evidence disclosed bit by bit by the earth itself, as volcanoes, glaciers, mountains, plains, rivers, and oceans were searched and analyzed. The final evidence as shown by studies of the atom, which brought a new concept to the entire situation, is vividly portrayed. We are very fortunate to have men living among us today whose names will live as long as we continue to record history. It all seems so simple to us now in the face of the overwhelming evidence presented, but this story clearly indicates that each new fact discovered had to be proven again and again before acceptance by a change resisting world.

—W.H.A.

"Thar's Gold in Them Thar Hills!"

(Concluded from last issue.)

Captives of the Comanches came back telling how the squaws and prisoners were forced to hammer out ornaments from raw silver while the braves disappeared into the hills only to come back heavily laden with rich ore.

The Lipan Indians, a branch of the Apaches, were also believed to have known the whereabouts of the mine. James Bowie, early frontiersman, allegedly lived with the braves and joined their tribe to learn this secret. As soon as he had reportedly seen the mine for himself, he went back to San Antonio to raise a force to take over the silver. The Indians seethed with hatred. After daylight 164 warriors swarmed down on the camps. But the Texans were used to a good fight. They held their own, losing one man, and ending up with three wounded. The Indians, by contrast, had 50 dead and 35 wounded. It took the white men ten days to hobble back to San Antonio.

Did Bowie find the mine while on this trek? The ruin of the old Spanish stockade at San Saba has stone gateposts. There is a carving on one of them that reads: "Bowie Mine, 1832."

The camp sutler at Ft. McKavett, 20 miles northwest of the Lechuza Ranch, reported a strange happening. Indians wandering about on the ranch suddenly seemed to disappear into the earth. In a few moments, they came forth and rode away. The sutler, investigating, found a hole about 30 inches wide. Cinching his lariat around a nearby boulder, he lowered himself into the earth. When his eyes had adjusted to the darkness, he found he had gone down about 20 feet. On the floor, against one wall, was a skeleton sprawled over a pile of silver bars. The metal was so heavy that the soldier could not lift even one.

In the months that followed, army life kept him so busy he could not return. Two years later he hunted for the hole, but a brush fire had destroyed his landmarks, and the opening into the earth had disappeared.

Sitting around a Texas campfire you might well hear the story of the cannonballs. One night a man drove up to a farm house in the hill country and asked the owners if they had any relics to sell. The answer, of course, was no. Not to be discouraged, the stranger pointed to an iron ball in the yard. The housewife laughed and said it was just a metal plaything for her children. It had been turned up while her husband was plowing the field. The visitor then bought the ball and, taking an axe, smashed it. It was filled with gold nuggets. He split the loot between them, explaining that the early Spaniards had used four cannon balls to mark the boundaries of the mine. But no one could say just where the metal ball had been uncovered from the earth.

There are said to be many marks pointing the way to the mine. These include a piece of rock jammed into the knothole of a tree, a pickaxe plunged into a tree up to its handle—the rusty point directing the prospector toward the granite hills of the Llano. Enough treasure maps have turned up over the years to paper a good-sized barn.

One of the more famous of these maps was held by a young Mexican lad, who—according to the story—came to Texas to hunt the fortune about which his dying father had told him. It seems that this boy, known as Aurelio, was a kind of modern-day Hamlet. Upon his father's death, his mother had married her late husband's brother, a tyrant to his stepson. The grasping uncle took the entire fortune. All that the Mexican youth had was a treasure map drawn for him by his father. Aurelio is said to have been murdered in Texas, and his map, like so many others, just disappeared.

The stories go on and on. Some of them are good listening. And some of them, undoubtedly are founded on truth. But where are the mines? Somewhere . . . perhaps you could find them!

(Many of the facts for this article were taken with permission from "Gold Guns and Ghost Towns" by W. A. Chalfant, and "Coronado's Children" by J. Frank Dobie.)

WINTER WEATHER IS NO OBSTACLE TO GEOLOGISTS IN THE BOULDER, COLORADO, REGION!

Midwest Club News

Bernice Wienrank, *Club Editor*
4717 North Winthrop Avenue
Chicago, Illinois

Flint Hills Geology Club enjoyed a social meeting on Dec. 16, at the home of Mr. and Mrs. Norman Walrafen. Mrs. Walrafen showed colored movies that were taken on recent trips to Old Mexico, Arizona, the Northwest and British Columbia. New additions to the collections of Mr. and Mrs. Walrafen and C. H. C. Dudley were on display. A. L. Graham, president of the San Fernando (Calif.) Mineral Club, sent favors for the evening: three kinds of Western minerals, enough so that all members could have a sample of each kind. Local favors were polished cross sections of horn coral from Greenwood County.

*

Central Illinois Rockhounds Society on Dec. 2 heard Margaret Parker, of the Illinois Geological Survey, give an illustrated talk on "Australia." Miss Parker, who formerly lived in Australia, told her audience many little known facts about that interesting country.

*

Central Iowa Mineral Society took a rock-collecting trip around the world on November 2, via a set of 64 colored slides of "Minerals of Other Lands." The pictorial mineral collection was obtained from W. Scott Lewis of Palm Springs, Calif.

*

Michigan Mineralogical Society on Nov. 25 visited the homes of Wesley Mollard and John and Lillian Mihelcic to view their mineral collections, which are two of the largest and finest private mineral collections in Detroit.

The society's educational display for December featured minerals that are important in medicine.

*

Minnesota Mineral Club visited the Portsmouth mine during its September field trip to the Cayuna Range. At the far end of the mine, MMC member Al Holler discovered two large boulders containing vugs of beautiful jet-black crystals. He chipped off several specimens, wondering at the time just what they could be. A diligent search in Dana produced no clues as to the identity of the mineral. A chemical test of the crystals indicated that they were high in manganese content.

Several weeks later at the convention of the American Mineralogical Society, Mr. Holler caused considerable excitement when he showed the mystery crystals to some of the visiting mineralogists. They were recognized as Groutite, $HMnC_2$, a mineral of the diasporegoethite group, that was first noticed in 1942. The mineral was named after Professor F. F. Grout of the University of Minnesota. It has been found in the Sagamore, Mangan No. 2, and Mahnomen pits in the Cayuna Range. The majority of Groutite crystals are wedge or lens-shaped and their faces are curved in a way that it is almost impossible to measure them. The crystals are black with a hardness of about 6 and a submetallic to adamatine luster.

Some of the mineralogists attending the convention were making x-ray diffraction studies of Groutite, and had been able to obtain only small amounts of dust-like specimens for research. They have larger specimens now!

*

JOLIET MINERALOGIST SOCIETY enjoyed its annual Christmas party on Dec. 13. Highlight of the evening was the most unusual demonstration, "Adventuring in Crystals," put on by Professor Robert Price of the Joliet Junior College. Dr. Price caused crystals to grow, and projected the growth on a screen through polarized light. His audience was held spellbound, as the most gorgeous colors and combinations of colors that can be imagined appeared on the screen in one crystal adventure after another.

*

MICHIGAN GEM AND MINERAL SOCIETY on Dec. 8 viewed two excellent films on geology and mineralogy.

For the convenience of its members MG&MS has had its emblem made up as armbands and pocket patches. The emblem depicts a yellow outline of the state of Michigan on a blue circle bordered by the club's name.

*

EARTH SCIENCE CLUB OF NORTHERN ILLINOIS on Jan. 11 featured a series of short talks on the "Mysteries of Paleontology." The following topics were covered: "Life, Time and Fossils," by William Kelly; "Solitary and Colonial Corals," by Orval Fether; "Trilobites," by George Malott; "Fern Fossils," by Harry Witmer; and "Dinosaurs," by Dr. Wilbur Hoff. All of the speakers are members of ESCONI.

*

ST. LOUIS GEM AND MINERAL SOCIETY'S Christmas party on Dec. 8 was climaxed by an exchange of appropriate rockhound type of gifts.

*

CINCINNATI MINERAL SOCIETY on Nov. 28 heard Dr. Thomas Cameron, associate professor in the Chemistry Department of the University of Cincinnati, discuss "Garnets." The garnet group, Dr. Cameron said, includes six subspecies, which are made of similar silicates combined with various metallic elements. The commercial gem garnet is the subspecies almandite, whose classic location is Alaska, where it is found embedded in mica-schist.

Since garnets are classified as a secondary mineral, Dr. Cameron described how a chemically active fluid, influenced by the heat and pressure associated with the movements of the earth, can be completely recrystallized in an effort to adjust to a new physical environment. During his talk Dr. Cameron used specimens from his extensive collection to illustrate his points.

*

WISCONSIN GEOLOGICAL SOCIETY on Oct. 12, presented a program on "Fossils" on the Milwaukee TV station WISN. The program was divided into three parts. First Gilbert Thill displayed and explained his trilobite collection; secondly Oliver Lex discussed Mazon Creek fern fossils while showing prize specimens that he had obtained from the strip mines near Joliet, Ill. and finally Joseph Wells gave a talk on dinosaurs, which he illustrated with miniature models of the various species. The TV station complimented WGS on the very interesting program.

*

Nebraska Mineral and Gem Club recently visited the Old County quarry near Wymore, Neb., to collect the heavenly blue celestite crystals that fan out in the calcite nodules found in this particular quarry. Several outstanding specimens were found. This quarry contains a large strata formation of blue-gray silt stone that visually shows petrified forms of sea life, such as bone fossils and shells.

Chicago Rocks and Mineral Society on Jan. 12 heard Elmer Rexin, plant manager of the Nunn-Bush Shoe Co., lecture on the "Mysterious Nunn-Bush Well." This is one of the few wells in the world which acts as a seismograph. It has registered, by the rise and fall of its water, ninety-eight per cent of the earthquakes that have occurred in the last few years. Mr. Rexin has devised special recording equipment to keep tab on the well.

Miami Valley Mineral and Gem Club on Jan. 13 was scheduled to hear M. Shelow of Dayton, Ohio, speak on "Jewelry and Jewelry Making." The club meets the second Sunday of each month at 2:00 p.m. in the Fairborn, Ohio, YMCA building.

*

Chicago Lapidary Club heard an informative lecture on "How Gems are Born," by Earl Martin of Ann Arbor, Mich., on Dec. 6. Mr. Martin, who is a gem dealer, has a famous private gem and mineral collection. On display at the meeting was the club's sixth annual jeweled Christmas tree.

NEWS OF OTHER SOCIETIES

Wasatch Gem and Mineral Society on Nov. 7 participated in a combined meeting of the Mineralogical Society of Utah, Golden Spike Gem and Mineral Society, and Dugway Gem and Mineral Society, which was held in honor of James Hurlbut, president of the Rocky Mountain Federation of Mineralogical Societies. After an address by Mr. Hurlbut, Dean Moffat showed a series of 3-D pictures.

*

Colorado Mineral Society will be host to the combined conventions of the American Federation of Mineralogical Societies and the Rocky Mountain Federation of Mineralogical Societies, June 13-16, in Denver, Colo. The National Gem and Mineral Show will be held in conjunction with the convention.

*

Miami Mineral and Gem Society brightened the yuletide for patients in the Veterans Hospital at Coral Gables, Fla., by giving them rings, earrings, pins, pendants, and cuff links for them to give to their loved ones as gifts on Christmas day. The jewelry was made by members of the society in the club's own workshop.

*

Verdugo Hills Gem and Mineral Society on Dec. 27 celebrated the holiday season with a pot-luck supper and gift exchange. A gold nugget was raffled off during the evening.

COMPTON GEM AND MINERAL CLUB on Dec. 6 viewed a series of slides showing mines and quarries in California. Don Graham, who prepared the slides, discussed the importance of the mineral deposits in California and their geologic background.

*

MINERALOGICAL SOCIETY OF PENNSYLVANIA was addressed on Dec. 9 by Dr. Edgar T. Wherry, who is a professor emeritus of the University of Pennsylvania and was a pioneer in the field of fluorescence. Dr. Wherry, who chose as his topic "A Mineral Collector Speaks" told of the new and old locations of mineral deposits in Pennsylvania and related many interesting adventures that he had while collecting.

*

WICHITA GEM AND MINERAL SOCIETY on Nov. 11 made a field trip to several locations in eastern Kansas to collect fossils. Thirty-one members participated in the outing and were rewarded with many good specimens of horn coral.

*

GEM CUTTERS GUILD OF BALTIMORE heard Dr. Russell T. Boyd of Ontario, Canada, on Nov. 13. Dr. Boyd spoke on "Opal Mining in Australia" and then showed a film of "Opal Mining in Lightning Ridge," the famous location where black opals are found. He also displayed a large collection of rough and polished opals.

RECOMMENDED READINGS

"Germanium," by George E. Smith, November-December issue of *The Sooner Rockologist*. Until recently germanium was mostly a laboratory curiosity. Today it has achieved commercial importance because of its unusual property of conducting electricity in one direction only. It is this property which has made possible transistors, which are replacing vacuum tubes in more and more uses.

*

"Methods of Fossilization," by Larry Skelton, December issue of *Evansville News Letter*. Six different methods have preserved evidence of long extinct life through eons of time.

*

"Astronomy," by George Gelakowski, December issue of *Earth Science News*. A brief discussion of the proposed earth satellites and what new information they are expected to gather from outer space.

(A mimeographed address list of publications will be furnished on request by the Club Editor.)

"In Arizona, over a million dollars worth of gold was scratched out of Rich Hill with kitchen knives. Along Big Bug Creek $38 was washed out of one pan alone, and a gold nugget found there weighed 39 ounces. The displays together with demonstrations of gold panning will show what to get and how to get it when you pan gold nuggets for your collection. They may be small nuggets. We saw a pill bottle full panned just recently from Big Bug. But again you might find a whopper just around the bend."

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Gem Production Depends on Rockhounds

Says Director Thomas H. Miller, of the Federal Bureau of Mines, in *This Week* magazine:

Last year some 50,000 children and adults, members of a fast-growing new group of hobbyists called "rockhounds," picked up stones and pebbles from the beaches, woods and fields of America that had an estimated value of more than $700,000. These were no ordinary rocks, but gem stones. They can be found throughout the 48 States and Alaska.

Ranging from the agate, which is the most widely distributed, to less common but still plentiful rocks and pebbles—like jade, opal and zircon—70 different kinds of semiprecious gem stones are found in the U.S. Although we are very poor in precious stones like diamonds and emeralds, we are unsurpassed in our quantities and varieties of gem stones. . . .

The great thing about rockhounding is that it adds zest to the very pleasurable pastime of walking along scenic paths. Many a father and son now make pebble exploration an exciting week-end pursuit.

You will probably be surprised to learn that almost all the gem production in the U.S. depends upon the finds of these amateur rock hunters. We have virtually no commercial gem exploration in this country. That is one reason why the Bureau of Mines is so anxious to encourage rockhounding. Another reason is that sooner or later one of these rockhounds is going to make a "find" of one of the many important strategic minerals, such as manganese or nickel or brillium, which we desperately need.

The more people we can interest in rockhounding, the better our chances of finding some of these minerals. . . .

March-April Issue

In our next issue, see informative article on "Basic Principles of Rockology," by William H. Allaway, with diverting illustrations, of which this is a sample.

WE WONDERED ABOUT THE MANY ROCKS WE HAD GATHERED

Also look for "Flowers of the Mineral Kingdom," by E. D. Cornwell.

ROCKHOUND BEGINNER'S SECTION.—We are continually striving to make EARTH SCIENCE a magazine which will always be of utmost service to its readers. After considerable study we have arrived at the conclusion that we have perhaps given altogether too little attention to the needs of our newcomers and also the younger rockhounds who are just beginning to wonder "what this is all about?"

We find that we were mistaken in assuming that most of these beginners were already more or less familiar with many of the fundamental principles of geology and mineralogy and that there was therefore little if any need to cater to them. We now feel that was not the fact, and so with next issue we shall introduce a series of articles by William H. Allaway, which are truly elementary and so simply handled that all who read them will soon become better acquainted with fundamentals.—EDITOR